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ABSTRACT

The Instructional Systems Technology Distance Master of Science program is one of the first degrees of its kind to be offered at Indiana University. Other than an initial on-campus orientation, it can be completed entirely via the Internet. The first course for this program was offered Fall of 2000 with 18 students enrolled. This same semester, a research team analyzed the monetary costs and pecuniary benefits of this program in a cost-benefit analysis. They identified the costs and benefits from the perspective of the department. Using these, they calculated the costs to benefits ration. Although the team concluded that the distance program had a high costs to benefits ratio, there are many valuable benefits which were not monetarily included in the analysis. This report also offers recommendations for further cost-benefit analyses of a distance education program. (Contains 16 references.) (Author/AEF)

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Cost-Benefit Analysis: Case study of the Distance Master of Science Program in the Department of Instructional Systems Technology, Indiana University

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Abstract

The Instructional Systems Technology Distance Master of Science program is one of the first degrees of its kind to be offered at Indiana University. Other than an initial on-campus orientation, it can be completed entirely via the Internet. The first course for this program was offered Fall of 2000 with eighteen students enrolled. This same semester, a research team analyzed the monetary costs and pecuniary benefits of this program in a cost-benefit analysis. They identified the costs and benefits from the perspective of the department. Using these, they calculated the costs to benefits ratio. Although the team concluded that the distance program had a high costs to benefits ratio, there are many value benefits which were not monetarily included in the analysis. This report also offers recommendations for further cost-benefit analyses of a distance education program.

Introduction

For Fall semester 2000 the Instructional Systems Technology (IST) department in the School of Education at Indiana University established an online Distance Master of Science (DM) program. It was designed and developed to mirror the on-campus IST Master of Science program.

As part of the on-campus course *R563: Business and Economics of Training and Development*, a team of six students conducted a cost-benefit analysis (CBA) for the DM program in the Fall of 2000. Literature shows that most studies of online learning environments have been conducted to examine educational advantages and to explore effective design strategies (Jung & Rha, 2000). In contrast, the R563 team, working with Dr. Charles Reigeluth, Director of the DM program, focused their analysis on the monetary costs and benefits to the IST department and/or the School of Education. For simplicity, these will be referred to as "the IST department" or "the department."

By presenting a breakdown of the developmental and ongoing costs and benefits, this report provides information from which the IST department could base future DM program decisions. This report may also be useful for others who are responsible for the design, development, implementation, and maintenance of distance education programs in higher education.

Literature Review

Distance Education

According to Molenda (1996), "distance education refers to a program of some duration, leading to formal recognition of achievement, in which the learner is separated from the instructor and in which special arrangements have been made to facilitate dialog between the remote students and an instructor." Keegan's (1980) definition of distance education is still widely used today. He defines the principle characteristics of distance education as the separation of teacher and learner; influence of an educational organization; use of technical media; provision for two-way communication; and possibility of occasional meetings.

In general, educators believe that distance education is subject to economies of scale and that the primary benefit of this form of education is that costs can be distributed over a large number of students. It is seen as a probable money-making venture because of the greater number of students who could potentially enroll versus traditional on-campus programs. The higher the revenue overall, the lower the cost per student would be (Inglis, 1999; Whalen & Wright, 1999). While this potential to exploit economies of scale exists in distance education, it does not mean that only programs with high student enrollment can be cost beneficial (Curran, 1995).

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Cost-Benefit Analysis

When conducting a cost-benefit analysis, dollar amounts are examined for both the costs and benefits. The costs are then compared to the benefits in a costs to benefits ratio. This allows one to determine the extent to which the monetary value of a program's benefits outweigh the costs (Sikorski et al, 1991). If the decision were purely economical, a program would exist only if the costs to benefits ratio were less than one, meaning, monetarily, benefits have exceeded the costs.

An advantage of cost-benefit analyses is that programs can be directly compared no matter what their platform, desired outcomes, values, and delivery systems are. Everything is converted to monetary values and thus can be directly compared.

The primary disadvantage of a cost-benefit analysis is that oftentimes it is difficult, if not impossible, to account for every foreseeable cost and benefit in monetary amounts (Levin, 2000). This is especially true for certain value-based benefits, which are often left out of a CBA (Cukier, 1997). For this reason, it is important to consider other cost-analyses, such as cost-effectiveness, cost-utility, and cost-feasibility when deciding whether or not to pursue a particular program.

Measuring Costs

As part of a study conducted at Marshall University, Morgan (2000) divided costs into categories to help determine the cost of online courses. Based on this study, three main cost categories emerge:

1. *Capital and recurrent costs*: These occur on an ongoing basis, such as technology support, equipment upgrades, indirect costs, and course maintenance.
2. *Production costs*: These are incurred during the development of courses, including factors like providing software to students.
3. *Delivery costs*: These costs are associated with teaching a course, such as instructor salary, course-related mailings to students, and opportunity costs related to teaching a course instead of doing an alternative.

These costs can be broken down even further to include hidden costs, technology specific costs, support personnel costs, faculty training costs, and/or administrative costs (Morgan, 2000).

Whalen and Wright (1999) compared the capital, production, and delivery costs of online courses with the costs of equivalent courses taught in the classroom. They made the assumption that the learning outcomes were the same. Their capital costs included the cost of the server which housed all courses. They divided production costs into six areas: instructional and multimedia design costs; the cost of producing text, audio, video, graphics, and photographs; the costs of authoring and delivering software, or the cost of licensing and delivering commercial software; the costs of testing and modifying course content; student and instructor training costs; and final course testing costs.

For their analysis, they also divided their costs into fixed and variable costs. They defined fixed costs as costs that remain the same regardless of the output and variable costs as those that vary directly with the amount of output —so fixed costs are the same no matter how many students are in a course, while variable costs increase with the number of students.

They determined that online courses tend to have higher fixed costs than classroom-based courses, but that these costs are offset by lower variable costs. Due to the reduction in course delivery time and the potential to deliver courses to a larger number of students, they found online courses to be more cost-beneficial than classroom teaching.

Whalen and Wright chose to ignore costs that would have been incurred had a course been delivered in a classroom (sunk costs) in their analysis on online courses. They identified these costs as instructor salary and benefits, equivalent costs of course development, course materials, administrative support, and classroom overhead.

After gathering cost information for both online and traditional courses, Whalen and Wright used costs to benefits ratio analyses to determine the breakeven number of students required to recover costs over five years.

In a similar study, Bartolic-Zlomislic and Brett (1999) analyzed costs and benefits of an online graduate course at the University of Toronto. Their analysis projected that the online course would likely make a profit of 1,962 Canadian dollars per year. They also calculated that 19 students would be needed to achieve a breakeven point.

Measuring Benefits

When he estimated monetary value, Cukier (1997) divided benefits into three categories:

1. *Performance-driven benefits*: These include cost savings, revenues, and other income. These benefits are usually the easiest to quantify and thus lend themselves easily to a cost-benefit analysis.
2. *Value-driven benefits*: From a departmental perspective, these may include time efficiency, flexibility, consistency in quality of delivery, ease of access to the technology, the quality of student-teacher interaction, the rate and ease by which material can be updated and changed, the appearance of being at the cutting edge of technology, opportunities for on-campus students to produce the online course, and expansive delivery with limited interaction.
3. *Value-added, societal, or indirect benefits:* These include reduction in capital investments (fewer buildings and parking lots), reduction in pollution, increased job creation, new business opportunities (telephone companies, publishers), reductions in social community costs, the creation of secondary markets, time savings, revitalizing a curriculum and faculty, reaching new markets, and increasing student diversity.

An organization may adopt a value-based approach to a CBA to stress the importance of understanding the pedagogical needs and values when judgments are made about costs and benefits. The main strength of a value-based approach is that it allows for a subjective definition of benefits, therefore making it a flexible technique (Cukier, 1997). Such an organization may decide that a program which may have a high costs to benefits ratio is still worth pursuing because of the value it offers.

All benefits, as well as costs, are determined on a program by program basis as each organization has differing pedagogical needs and values. For example, one possible value-driven benefit for an online program might be expansive delivery with limited interaction. However, for another organization which values interaction, this would be viewed as a cost.

Measurement

The data were collected from four separate sources:

1. *Cohort Study:* Data concerning faculty salaries were taken from the Cohort Study located in the Dean of Faculties at Indiana University.
2. *Questionnaire:* General data regarding the use and opinions of the DM program were gathered using a survey questionnaire. It was distributed to and filled out by several faculty members, staff members, and graduate assistants who were directly involved in the program.
3. *Personal Interviews:* From the respondents of the questionnaire, the team selected individuals to be interviewed. They were: Dr. Charles Reigeluth, Director of the DM program; Dr. Robert Appelman, Head of Technical Support; Prof Elizabeth Boling, IST department Chairperson; Carthel Everett, Contract and Grants Specialist in the School of Education; Susie Sloffer, DM program graduate assistant; and Bill Dueber, technical support graduate assistant. These interviews focused more specifically on costs and benefits regarding the DM program.
4. *Online Resources:* Websites on various distance education programs at Indiana University and at other institutions added to the general knowledge and understanding of costing a distance education program. Of these, the most beneficial was Morgan's (2000) study.

Methodology

Gathering Cost Data

Based upon Morgan's (2000) study, the team gathered cost information for the first academic year of the DM program and placed it into the three categories:

1. *Capital and recurrent costs*: Server, server administration, data communications charges, maintenance, equipment, technological support, and indirect costs.
2. *Production costs*: Faculty training for online course tools, course development, course materials, and licensing software.
3. *Delivery costs:* Instructor salary and fringe benefits, director salary, graduate assistant support, adjunct instructor wages, and opportunity costs.

Gathering Benefit Data

The team organized the benefits for the first academic year of the DM program based on Cukier's (1997) benefit categories:

1. *Performance-driven benefits*: Funding for development, student tuition, and technology fees.
2. *Value-driven benefits*: Time efficiency, flexibility, ease of access to the technology, the rate and ease by which material can be updated and changed, the appearance of being at the "cutting edge" of technology, opportunities for on-campus students to produce the online course, and expansive course delivery to capitalize on economies of scale.
3. *Value-added, societal, or indirect benefits:* Reduction in capital investments, increased job creation, time savings, revitalizing a curriculum and faculty, reaching new markets, and increasing student diversity.

Results

Costs and Benefits

The results of the data are summarized as follows (see Appendix A for the detailed breakdown):

ACTUAL COSTS AND BENEFITS	TOTALS
Benefits	$91,606.40
Less: Costs	$177,159.41
NET	($85,553.01)

Using the cost and benefit data, the team calculated the costs to benefits ratio.

Costs to Benefits Ratio

Costs	$177,159.41
Benefits	$91,606.40
Ratio	1.93

This ratio shows that costs for the DM program are nearly twice the monetary benefits.

Discussion

DM Program Costs to IST

It is clear that the IST DM program is not a money making venture. But, it must be remembered and emphasized that this program was not launched nor was ever intended to be a profit producing entity. The motivation behind the DM program was, quite simply, to investigate the possibilities of offering an online program that would mirror the experience of the on-campus Master of Science program. Because of the current staffing situation and the labor-intensive nature of delivering an equivalent online degree, the enrollment has been capped at 20 students per course.

The team was able to approximate the indirect costs using percentage breakdowns provided by the School of Education. This data was then inserted into the cost calculation model from Marshall University. Some of the categories from Dr. Morgan's model did not apply to the IST DM program. For instance, the IST DM program was given the go-ahead from the School of Education on July 1, 2000 to begin in the Fall 2000 semester. The department had approximately one month to prepare the coursework. Thus, the IST DM program generated revenue in the first year. Dr. Morgan's model devotes the first year of a distance education program strictly to development with no student enrollment. Therefore, there were no monetary figures for performance-driven benefits.

Dr. Morgan's model also calls for costs of technology investment. However, the IST DM program had, and has, an extensive existing infrastructure within the School of Education and Indiana University. Because of this, the department did not have to purchase any extra equipment, including servers. There is also existing technology support that is provided for by the indirect costs. In their interviews, professors indicated that, in the near future, there will need to be an investment into technology support and maintenance for the DM program to continue. These are costs that will need to be considered in the future.

In this analysis, the team did not factor in opportunity costs. The Department has not assigned monetary values to the cost (or perhaps benefit) of not pursuing other teaching opportunities instead of the DM program. According to some survey responses, it takes roughly twice the time to prepare for and teach a DM course during this first year. The university currently pays the instructor the same amount for teaching an online course as it would for an on-campus course. The underlying assumption is that the time commitment for a distance education course is no greater than an on-campus course. This additional time could be spent mentoring students, serving on dissertation committees, conducting research, and publishing.

DM Program Benefits to IST

Of the three categories of benefits that the team used, only the performance-driven benefits had a specific dollar amount identified by the department. Value-driven and value-added benefits are not necessarily tangible, and thus more difficult to assign a monetary value. This does not mean these benefits are less important. To the contrary, value-based benefits may be the most important benefits in a distance education program. Moreover, depending on the pecuniary values assigned to value benefits, the total benefits may far outweigh the total costs. It is possible that this is the case in the IST DM program.

Performance-driven benefits:

- *Revenue generated:* Tuition, DM fees, and the startup money.

Value-driven benefits:

- *Institutional prestige*: By having a distance education program, the reputation of Indiana University, the School of Education, and the Instructional Systems Technology department as being on the cutting edge of research and technology is fortified.
- *Learning and applying opportunities*: Students in the on-campus program have opportunities to assist in producing the courses for the DM program. This provides the on-campus students with an opportunity to apply the skills they have learned by producing authentic online courses.
- *Publication possibilities*: The IST DM program provides numerous possibilities for faculty and students to conduct research that may lead to publication.
- *Anytime and anywhere*: Students in the DM program can complete their assignments when it is convenient for their schedules. The flexibility offered with distance education is not possible in an on-campus course.

Societal or value-added benefits:

- *Increased student diversity*: The DM program offers students that have career, family, or geographic constraints the opportunity to obtain a degree from the IST department. These students may have no other way of obtaining this degree.

- *New job creation*: With the DM program in place, two extra Graduate Assistant positions were created to help handle the extra workload. These positions would not exist without the DM program. Having these extra positions available may attract students who might otherwise attend a different institution.
- *Potential to revitalize the faculty and/or curriculum*: Having a distance education program can be a new source of motivation for faculty and staff members of a department. It can be seen as something new and exciting. Also, converting course material into an online version can inspire revisions in course content.

Recommendations

One of the most important steps in conducting an accurate cost-benefit analysis is converting all the costs and all the benefits into monetary amounts. This is very difficult, especially for the value-based benefits. In fact, the IST department did not have figures for these benefits. When conducting a cost-benefit analysis, it is recommended to have monetary amounts established for all costs and all benefits. Each institution should determine the value of these benefits, independently.

It is recommended that tuition be increased if the DM student enrollment is to remain capped at 20 students. Presently, all DM students pay residential tuition rates. This could be raised, especially for the DM students who are not residential students. The $30 DM fee could also be raised. These changes in tuition and fees would lower the costs to benefits ratio.

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